

REMARKS

The Amendments

With this amendment, claims 1 and 19-37 are pending herein.

Claim 34 been amended to change British spelling to U.S. spelling. A clerical error in claim 24 has been corrected. No new matter has been added.

Telephone and Email Communication with Examiner

The Examiner is thanked for the telephone and email communication of February 25, 2008.

During that interchange, the Examiner requested that the draft response provided her be submitted, and that she would address the arguments in her next Office Action. Therefore this response is not being filed with a Request for Continued Examination. The Examiner is invited to telephone the undersigned if she wishes to propose amendments to place the case in condition for allowance.

The Rejection under Section 102(b) over Ballard

Claims 19-21, and 23-37 have been rejected under 35 U.S.C. 102(b) as being anticipated by Ballard et al. (US 6,171,489). The Office Action states:

US 6,171,489 to Ballard et al. disclose and exemplify polymer beads and method for their preparation. Prior art polymer beads products are identical to those presently claimed and prepared by the identical dispersion polymerization process as used by applicant (see abstract; .col. 7, lines 11-30; working Examples). Specifically, said dispersion contains a continuous aqueous phase, an organic dispersed phase containing a functional monomer and a crosslinking monomer, magnetic particles (i.e. $\gamma\text{-Fe}_2\text{O}_3$), solid dispersing agent is used in the formation of polymer beads (col. 2, lines 50-61; col. 3, lines 25-64; col. 5, lines 1-29). Suitable crosslinking monomer, functional monomers include the presently recited amine group-containing monomers and those which can be post-reacted to form the

amine functionality (col. 4, lines 5-12) are disclosed. Furthermore, backbone monomer, porogen, and stabilizing agent were taught (col. 4, lines 16-45; col. 5, lines 22-29, 50-67). Accordingly, the instant invention is anticipated in view of prior art disclosure.

Applicants previously argued that the cited reference makes no disclosure or suggestion whatsoever of producing the polymeric beads in a form suitable for use as a **complexing resin**. The Examples of this reference all give rise to **ion exchange resins**, not **complexing resins**. Nor can these ion exchange resins be treated in some other way to render them suitable for use as complexing resins.

The present Office Action counters these arguments as follows:

Applicant's amendment and remarks filed 9/26/07 have been fully considered but they are not persuasive. The crux of applicant's arguments lies in U8-489 does not disclose producing polymeric beads in a form suitable for use as a complexing resin as expressed in the preamble of the present claims because prior polymeric beads are primarily used as ion exchange resin. The examiner disagrees and takes the position that ion exchange resins fall within the scope of complexing resins. By definition, ion exchange resins contain functional groups that lend the resin capability of combining with or exchanging ions between the resin and a solution. Thus, "complexing" occurs as a functional of its mode of action. Applicants further urged there is no teaching whatsoever in US-489 that would in any way lead a person skilled in the art to prepared polymeric beads incorporating amine groups capable of complexing a transition metal cation. The examiner disagrees. Depending on the amount of trimethylamine/hydrochloric acid is added, not all aminated sites are in the form of quaternary ammonium groups, and thus would be capable of complexing a transition metal cation. Furthermore, prior art specifically teaches using functional monomers including dimethylaminoethyl methacrylate N,N-dimethylaminopropyl (meth)acrylamide, vinyl pyridine, diallylamine, N-vinyl formamide which all contain amine f groups capable of complexing a transition metal cation (col. 4, lines 5-11). Accordingly, the examiner's position is maintained.

The rejection is respectfully traversed.

It is noted that the Assignee of the present application is the same as the Assignee of the cited reference. The present application claims an improved resin that, unlike the resin described in the cited reference, is capable of complexing transition metals against a background of other ions.

The key to understanding the difference between the presently-claimed resin and that described in the reference is an appreciation of the distinction between a “**complexing resin**” as claimed herein and an “**ion-exchange resin**” as disclosed in the cited reference.

An ion-exchange resin is known in the art as a resin containing functional groups **having ionic charge** that is neutralized with either a negative or positive counter-ion(s). Upon being exposed in a solution containing solubilized cations or anions, the counter-ions associated with the resin exchange with the ions in the solution. Removal of the now "exchanged" ion-exchange resin from the solution therefore results in the ions originally in the solution being removed and counter-ions originally associated with the resin remaining in the solution. Resins that provide for such a net process are therefore known in the art as ion-exchange resins.

In contrast, a complexing resin is known in the art as a resin containing functional groups **in a neutral state** having an electron pair available for coordinating or complexing with a Lewis acid such as a transition metal cation. A person skilled in the art would appreciate that the process of complexation is a combination process that does not involve any exchange whatsoever. Thus, in the context of the present invention, the complexing resin comprises amine groups capable of complexing a transition metal cation. Upon being exposed in a solution containing solubilized transition metal cations, the neutral electron pair donor functional group (*i.e.*, the amine (N) group) associated with the complexing resin forms a complex with the solubilized cations. Removal of the now "complexed" complexing resin from the solution removes the cations originally in the solution without anything from the resin being exchanged back into the solution.

By virtue of the different chemical nature of complexing and ion-exchange sites, and the different mechanisms by which each site operates, complexing resins and ion-exchange resins have different capabilities and inherently present a different net effect in use. As stated in the specification hereof, at page 3, lines 22-26, “the resins contemplated in Australian patent No. 704376 [the Australian equivalent of the cited reference], are not

particularly suitable for use in separating transition metals from aqueous solutions as they would have poor capacity utilization due to their low selectivity for transition metals over innocuous background ions.”

The specification further states, at page 4, last paragraph: “In addition, the present invention provides for the preparation of polymeric beads comprising complexing amine groups which are suitable as complexing resins and demonstrate an ability to selectively remove transition metals from aqueous solutions in the presence of innocuous background ions under continuous high flow conditions.” Note that “innocuous background ions” are exemplified at page 3, last partial paragraph, as “alkali and alkaline earth metals such as Na^+ , Ca^{2+} or Mg^{2+} .”

The ability to selectively complex transition metals against a background of other ions distinguishes the presently claimed resins over the cited reference. Additionally, the ability to selectively complex transition metals under high flow conditions distinguishes the present claimed resins over other complexing resins. (See paragraph bridging pages 3 and 4).

The Office Action notes in point 4 that the cited reference discloses crosslinking and functional monomers that include the presently-recited amine group-containing monomers and those that can be post-reacted to form the amine functionality. In this regard, the Office Action directs our attention to column 4, lines 5-12.

The list of functional monomers referred to in the Office Action does indeed include a number of monomers considered suitable for use in the present invention. However, when considering the disclosure of such monomers in the cited reference it is important to appreciate the context in which they are disclosed. In particular, column 3, lines 54-60 of the cited reference state that “when the polymer beads are to be used as an ion-exchange resin [and no other use is disclosed or suggested], the organic phase should include a crosslinking monomer and a functional monomer that provides the necessary functional groups to give the polymer an ion-exchange capability or provide sites that may be later reacted to provide the required functional groups to confer ion-exchange capability to the

polymer.” In other words, the document clearly teaches the skilled addressee that if the functional monomers do not provide the necessary functional groups to yield ion-exchange sites, then they are to be reacted to provide the sites. Thus, the functional monomers disclosed at column 4, lines 5-12 in the cited reference are clearly presented to the skilled addressee as monomers that either provide for an ion-exchange site or are to be later reacted to provide such sites. In the context of the amine containing monomers, a person skilled in the art would without any doubt appreciate that the amine groups would need to be quaternarized to provide for the necessary ion-exchange sites.

Accordingly, in contrast with the assessment of this section of text provided in the Office Action, the cited reference teaches the use of amine-functionalized monomers in the context of them providing or being reacted to provide a quaternary ammonium ion-exchange site.

Toward the end of point 4 in the Action, it is mentioned that the cited reference "discloses and exemplifies forming a weak acid cation ion-exchange resin suitable for separating transition metal ions as contemplated by applicants". In reply, it is important to note that not only does the weak acid cation exchange resin disclosed in the cited reference not contain any amine groups capable of complexing a transition metal cation, but the resin itself is simply not a complexing resin in the first place. Furthermore, as indicated on page 3, lines 21-26 of the present application, resins contemplated in the cited reference (*i.e.*, the Australian equivalent of the cited reference) are not particularly suitable for use in separating transition metals from aqueous solutions as they have poor capacity utilization due to their low selectivity for transition metals over innocuous background ions. In other words, the weak acid cation ion-exchange resins contemplated in the cited reference are practically ineffective at separating transition metal ions in aqueous media which contain innocuous background ions such as Na^+ , Ca^{2+} , and Mg^{2+} .

As will be appreciated from the present specification, complexing resins in accordance with the invention overcome such problems. Thus, in addition to the weak acid cation exchange resin disclosed in the cited reference not being a complexing resin in the first place, the

ion-exchange resins disclosed in the cited reference have no practical utility in the field of separating transition metal cations from aqueous media.

Point 7 of the Office Action takes the position that "ion-exchange resins fall within the scope of complexing resins." In support of this position, the Office Action states that "ion exchange resins contain functional groups that lend the resin capability of combining with or exchanging ions between the resin and a solution. Thus, 'complexing' occurs as a functional [function] of its mode of action."

As discussed above, this is simply not the case. Complexing resins have a neutral charge and form a complex with the solubilized cations, **leaving nothing behind in the solution** when the resin-metal complex is removed. In contrast, ion-exchange agents have an ionic charge and ions of the resin **exchange** with ions in the solution, and **are left in the solution** when the resin and attached ions originally present in the solution are removed.

Accordingly, it is submitted that a person skilled in the art would not consider the disclosure of ion-exchange resins in the cited reference in any way to be a reference to complexing resins.

Furthermore, it is submitted that there is no disclosure or suggestion whatsoever in the cited reference that would lead a person skilled in the art to modify the procedure for making ion-exchange resins outlined therein to provide for a complexing resin of the type defined in the claims of the present application.

Point 7 of the Office Action expresses disagreement with our position that there is no teaching whatsoever in the cited reference that would in any way lead a person skilled in the art to prepare polymeric beads incorporating amine groups capable of complexing a transition metal cation. The Office Action alleges that depending on the amount of trimethylamine/hydrochloric acid added, not all aminated sites are in fact in the form of quaternary ammonium groups, and thus, would be capable of complexing a transition metal cation. This statement, apparently refers to the Examples in the cited reference, *e.g.*, Example I, in which trimethylamine hydrochloride is used as an amine to react with the

epoxy group of the glycidyl methacrylate moiety to form the quaternary ammonium ion-exchange sites (see at least column 9, lines 25-30). However, it is important to appreciate the chemistry behind the relevant reaction sequence. In particular, it is important to note that trimethylamine used in the Examples is a tertiary amine. Reaction of this amine with the epoxy group of the glycidyl methacrylate moiety (as shown at the top of column 9) by default forms a fourth bond to the nitrogen atom thereby forming the quaternary ammonium ion-exchange site. Thus, contrary to the comments in the Office Action, by virtue of the reaction mechanism, all of the aminated sites must be in the form of a quaternary ammonium group.

Again, it is submitted that such disclosure in the cited reference in no way amounts to preparing polymer beads incorporating amine groups capable of complexing a transition metal cations.

At the end of point 7, the Office Action again refers to the amine-containing functional monomers disclosed at column 4, lines 5-12 in the cited reference. In the context of using such monomers to prepare ion-exchange resins in accordance with the cited reference, which methodology is notably not exemplified at all, according to the teaching at column 3, lines 54-60, it would be necessary to react the polymerized residues of such monomers to provide the required quaternary ammonium ion-exchange sites. Any suggestion in the Office Action "that depending upon the amount" of reagents used not all aminated sites would be in the form of quaternary ammonium groups simply amounts to unsubstantiated conjecture and in fact goes against the very teachings of the document. In particular, the document clearly teaches that the functional monomers either provide or are to be reacted to provide the ion-exchange sites. A person skilled in the art would clearly not read this and consider it to mean that an insufficient amount of reactants than required to convert all available amine groups into quaternary ammonium groups should be added. To the contrary, it is submitted that a person skilled in the art would typically use excess reagents in order to accomplish this task.

As for any argument that a given reaction for converting amine groups into quaternary

ammonium groups would not convert all of the amine groups and thereby leave unconverted amine groups in the resin that would be capable of complexing a transition metal cation, it is submitted that in practice this would not in fact be the case. In particular, under conditions used to convert such amine groups to quaternary ammonium groups, any amine groups that were not converted (if this were to occur at all) would be by default not available for reaction and therefore inherently also not available to function complexing sites. Accordingly, if the Office Action were correct in that a given reaction did not result in complete conversion of the amine groups into quaternary ammonium groups, then it is submitted that any residual amine groups would also not be capable of complexing a transition metal cation.

Accordingly, it is submitted that the claims of the present application are both novel and inventive in the light of US 6,171,489.

The Nonstatutory Double Patenting Rejection

Claims 19-21 have again been rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3-4 and 6 of U.S. Patent No. 6,171,489. The Office Action alleges that "[a]lthough the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims encompass those in US-489."

This rejection is respectfully traversed. Even if the instant claims did encompass the present claims, this would not be proper grounds for an obviousness-type double patenting rejection. See MPEP Section 804 II, which states:

Domination and double patenting should not be confused. They are two separate issues. One patent or application "dominates" a second patent or application when the first patent or application has a broad or generic claim which fully encompasses or reads on an invention defined in a narrower or more specific claim in another patent or application. Domination by itself, i.e., in the absence of statutory or nonstatutory double patenting grounds, cannot support a double patenting rejection. *In re Kaplan*, 789 F.2d 1574, 1577-78, 229 USPQ 678, 681 (Fed. Cir. 1986); and *In re Sarrett*, 327 F.2d 1005, 1014-15, 140 USPQ 474, 482 (CCPA 1964). However, the presence

of domination does not preclude double patenting. See, e.g., *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968).

MPEP Section 804 II B 1(a) sets the standard for determining whether or not obviousness-type double patenting exists:

If the application at issue is the later filed application . . . a one-way determination of obviousness is needed in resolving the issue of double patenting, i.e., whether the invention defined in a claim in the application would have been anticipated by, or an obvious variation of the invention defined in a claim in the patent. See, e.g., *In re Berg*, 140 F.3d 1438, 46 USPQ2d 1226 (Fed. Cir.1998).

As discussed above in connection with the rejection under 102(b) over this reference, there is no teaching whatsoever in the claims of the '489 reference, or anywhere in the specification of this reference, that would in any way lead a person skilled in the art to prepare polymeric beads incorporating amine groups capable of complexing a transition metal cation. Thus, the present claims are not obvious over the claims of this reference. Withdrawal of the double patenting rejection is therefore respectfully requested.

The Information Disclosure Statement

It is again noted that the Examiner has initialed most of the references cited in the Information Disclosure Statement, with the exception of Corne et al. U.S. Patent No. 1190863 and a number of provisional patent applications. As the Office has access to these references in its database, it is respectfully requested that these references be reviewed and initialed.

Request for Rejoinder

It is respectfully requested that claim 1 be rejoined with the elected claims upon allowance of the elected claims. This is proper because claim 1 contains the novel technical feature recited in the elected claims, namely amine groups that are capable of complexing a transition metal cation, or the polymeric beads are reacted with one or more compounds to provide amine groups capable of complexing a transition metal cation.

Conclusion

In view of the foregoing arguments and amendments, withdrawal of the rejections is respectfully requested. This application appearing to be in condition for allowance, passage to issuance is also respectfully requested. It is believed no fee is due with this submission. If this is incorrect, however, please deduct the amount needed for this response, including any extension of time required, from deposit account 07-1969.

Respectfully submitted,
/ellenwinner/

Ellen P. Winner
Reg. No. 28547

GREENLEE, WINNER AND SULLIVAN, P.C.
4875 Pearl East Circle, Suite 200
Boulder, CO 80301
Telephone (303) 499-8080
Facsimile: (303) 499-8089
Email: usptomail@greenwin.com
Attorney Docket No.: 56-04